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To assess the effect of inequalities in school resource inputs on student achievement, a model is proposed which uses hypothetical experiments to compare, on the one hand, the average achievement of student groups with their present school resources and, on the other hand, estimates of their average achievement after their school inputs are changed in specific hypothetical ways. Multiple regression analysis was performed with data gathered separately for Negro and white students in grades 6, 9, and 12, from which the Northern and Southern regions of the country. For each group under examination, the following clusters of school resources were changed to be the same as those held by students in another or by students of another race: (1) School facilities and programs, (2) school teaching staffs, and (3) characteristics of fellow students in the school. In general, changes in the composition of the student body were found to be the most important influence affecting student achievement, while school facilities ranked as the least important. The inequalities of total school resources were found to be greater between races within regions than between regions, for a given race. (JH)

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SOME HYPOTHETICAL EXPERIMENTS ON VARIATIONS IN SCHOOL COMPONENTS AND SELECTED EDUCATIONAL OUTCOMES

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The Center for the Study of Social Organization of Schools

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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There have been a number of recent statements on the ways in which social and economic indicators might be regularly collected from the American population and employed as new guides to social policy.[2] Among these commentaries on the nature, maintenance and use of "social accounts" is one which concentrates on the development of models which identify mechanisms through which certain resources held by an individual or group in society are <u>transformed</u> or <u>converted</u> into other resources.[3] An empirical example of one such transformation process will be given to point up certain utilities of this general approach to "social accounting".

A fully developed model of the ways in which assets and deficits presently held by different groups in society are transformed into a new configuration of resources would involve the specification of many different institutional transformation processes, along with an identification of the resources which are converted by each of these processes, and the ways in which the different processes themselves are linked together in society. For example, different institutions such as the family, the schools, the occupation structure, the housing market, the consumption market or the political processes operate differently for different groups in this country. One institution has the potential for transforming sets of resources held by individuals that another institution may influence only indirectly.

In this paper, the public education system is examined as both a public resource and as a transformation process. As a public resource, the quality of the school system available to one segment of the population may differ

from what is open to other groups in the population. In particular, the quality of schools may differ according to their facilities and programs, the attributes of their faculty, and the environment created by the student body enrolled in the school. As an institutional conversion process, schools transform the resources of students who have entered the institution into new resources at school completion, resources with which the individuals confront other institutions such as the family and the occupational structure in our society. Students approach each level of education with certain skills and personality components resulting from earlier experience and background. These skills and components are converted by schools into new constellations of individual resources.

The examination of the transformation of resources within the formal educational system is closely linked to the discussions of definitions of inequalities of opportunity precipitated by the 1966 Office of Education report.[4] In this report, several different concepts of inequality were posed for examination. Comparisons between the resources of schools attended by different ethnic groups were made as one source of inequality: the inequality of school inputs. Also, defining inequalities in terms of school outputs, the differences in the average achievement of student groups were investigated. Still another definition of inequalities cited in the Report but not fully examined was to compare the levels of input resources to schools attended by minority and majority group students in terms of their effects on the outcomes of education. While the report did attempt to detail some important elements of the educational process in addition to the other investigations, it did not bring these separate analyses together to show inequalities in school inputs weighted according to their importance for

student achievement. When in the social accounts framework, schools are viewed as both a resource held differentially by groups and as a conversion process which transforms individual skills of students, it is this last definition of inequality which is treated.

The Technique of Hypothetical Experiments

The manner in which differences in school input resources will be examined in terms of the effectiveness for transforming student skills will be through the use of "hypothetical experiments." Comparisons will be made between the average achievement of student groups with their present school resources and estimates of their average achievement after their school inputs are changed in specific hypothetical ways. Three different measures of the personal assets which are transformed by schools will be investigated: the students' level of performance on a standardized verbal achievement test, the probability that an individual will fail the Armed Forces Qualifying Test, and the probability that an individual will not continue his education to college. There are three clusters of school resources which will be changed in these hypothetical experiments: school facilities and programs, school teaching staffs, and characteristics of the fellow students in the school. In the hypothetical experiments, for each group under examination, these school resources are changed to be the same as those held by students in another region or by students of another race.

The operations involved are the following:

1. Using information collected in the Fall, 1965, for the Equality of Educational Opportunity Survey, regression equations were obtained

separately for Negro and white students in three grades (6, 9 and 12) in two regions of the country (North and South). For each of these twelve groups of students, an equation was obtained where their achievement on a standardized test of verbal achievement was regressed on several indicators of the facilities, teacher attributes and student body characteristics in their schools, as well as several measures of the individual student's family background.[5]

For each of the grade-race-region groups, an equation of the form

$$y = a+b_1X_1 + b_2X_2 + \ldots + b_iX_i + \ldots + b_nX_n \qquad (1)$$

was obtained, where the estimated regression coefficients, b_i, give the amount of average change in verbal achievement scores (y) which accompany a unit change in family or school measure X_i.

2. Hypothetical experiments were conducted using two sets of data: (a) the twelve multiple regression equations, and (b) the average values on each of the family and school measures ($\bar{X}_i$) held by each group.

The technique was to obtain an estimate of the expected average achievement level for each group by substituting a specific set of $\bar{X}_i$ values into the regression equation for that group and solving for y.

For example, in the twelfth grade, an estimate of the actual average achievement of the Northern Negro students is simply the value obtained by entering the values ($\bar{X}_i$) of the family and school measures for this group in the regression equation for the group, and solving for y. To obtain an estimate of the achievement for this group if their teachers were changed to be the same as the teachers of Northern white students

while they retain the same family, school facility and fellow student resources, the same equation would be solved after substituting the $\bar{X}_i$ values of Northern white students for the teacher variables (keeping the Northern Negro $\bar{X}_i$ values for the other variables in the equation.) In a similar manner, estimates can be obtained of the average achievement of Northern Negro students with the school facilities of Northern whites, or with the fellow-students of Northern whites, or with the school or family characteristics of some other group. In fact, all combinations of such hypothetical experiments were conducted for the 4 groups in each grade.

3. A correspondence was made between the different predicted average achievement scores and the probability of passing the Armed Service Qualifying Test, and the probability of completing the twelfth grade and continuing to college. Other materials are available which relate the percentile scores received in different regions of this country on the Armed Forces Qualifying Test to being accepted into the military services, and to the number of years of school completed.[5a] When the achievement scores of the Office of Education test are expressed in percentiles, these other materials can be used to make correspondences with the probability of being accepted into the military service and the probability of continuing school beyond a certain level.

Results

The next series of tables will present the results of the hypothetical experiments which show comparisons of average achievement scores for

student groups with different sets of resources. There will be three questions addressed in the comparisons to be presented: (1) Which of the three clusters of school input resources -- facilities, teachers, and student environment -- shows the most important differences when weighted in terms of effects on achievement? (2) Are the differences in input resources due to regional disparities greater than the differences due to racial disparities within regions? (3) What is the magnitude of differences in school input resources when assessed in terms of their effectiveness for achievement?

Table 1 shows the expected levels of achievement of Negro students when the racial disparities in school resources are adjusted within each region by means of the hypothetical experiment technique. The rows in Table 1 indicate how the expected achievement levels of Negro students would change when present resource levels are changed to match those held by white students in the same region. Results are presented for three different grades in school. Achievement differences are reflected in the average scores on a standardized test of verbal achievement, the percent who would fail the Armed Forces Qualifying Test and the percent who would not reach college.

Several things are noteworthy from this Table. First, there is a clear ordering of the three component school inputs in terms of the effects of racial disparities within regions on Negro student achievement. Table 1 shows that the disparities in student environment are most important when weighted by their effectiveness for achievement, and that differences in school facilities are least crucial. In five of the six

groups shown in Table 1, the improvement in Negro student achievement is greatest when they are assigned the fellow-students of the whites in their same region compared to the changes due to assigning them the school facilities or teachers of the whites. In the one case which is an exception (South Negroes, grade 9), teachers are most important, but the results for changes in student environment and teachers were quite close. Also in five of the six cases, changes in school facilities were seen to have the least effect on achievement levels. In the single exception (Northern Negroes, Grade 9), changing teacher resources had the least impact, with school facilities intermediate between teachers and student environment.

The separate results from the Office of Education Report contribute to this finding of inequalities of inputs weighted by their effectiveness on achievement. The original report treated input differences within regions, and the relationship between school factors and student achievement as separate questions. It was reported that the greatest differences in inputs within regions were to be found for student body characteristics.[6] Moreover, this component was also the one most strongly related to Negro student achievement, while differences in school facilities showed very little relationship.[7] Both of these separate results contribute to the present finding. Here, inequalities are revealed which derive from both the size of the racial disparities of different inputs within regions and from the relative importance of school components for achievement. In view of the earlier separate results, it is not surprising that when existing school input differences are shown weighted according to their effectiveness

for achievement, the student environment resource inequalities are greatest and the school facility resource inequalities are smallest.

The second thing to notice from Table 1 is the size of the achievement changes due to assigning Negroes the school resources of whites. In the twelfth grade, the substitution of all three sets of whites' school resources bring the predicted level of Northern Negro achievement up four points, slightly more than one third of the distance to the national average. When twelfth grade Southern Negroes are supplied with these resources, the achievement output is raised six points, also a little over one third of the distance to the national average. Note that in both cases over half of the total expected effect comes from the addition of student environment resources. The findings for the sixth and ninth grades are quite similar.

In addition, the effect of assigning the school resources of Southern whites to Southern Negroes is to bring Southern Negro achievement up very close to that of Northern Negroes, when the latter group is held to its present level of resources. The initial disparity between Southern and Northern Negro achievement is nearly eliminated when Southern Negroes are given the school resources of whites in the South. Indeed, if Southern Negroes are supplied with the family resources of Southern whites, Southern Negro achievement exceeds the average for Northern Negroes. In different words, if Southern Negro students were provided with the school and family resources of white students in their region, their expected level of achievement would be higher, on the average, than the present Northern Negro level. Elimination of the Southern racial disparities would more than wipe out Negro regional disparities.

Even more striking are the effects of the changes in school resources for reducing the rejection rate from the Armed Forces. For Negroes who had begun the twelfth grade, 20% of those presently in the North and 33% of those in the South could expect to fail the AFQT. The substitution of the three sets of whites' school resources reduces the rejection rate to 13% for those in the North, and to 19% in the South.

Table 1 deals with inequalities due to racial disparities of input resources within the two regions. Table II focuses on regional disparities of input resources (within racial groupings) by comparing expected achievement levels of Southern Negroes and Southern whites when they are assigned the resources held by Northern students of the same race.

White students in the South are not affected to any marked degree by operating with the school resources of white students from the North rather than their own school resources. In the sixth grade, the increment in Southern whites' achievement due to changes in all school resources is about 0.5 points, and in the ninth and twelfth grades the increments are approximately 2 points. Moreover, no single component of school input resources contributes much more than others to these small increases in Southern white achievement, although school facilities tends to lead the others slightly. The Southern Negro students, on the other hand, gain about 2 points in the sixth and twelfth grades and nearly 6 points in the ninth grade after the resources of Northern Negroes are

supplied to them. Regional differences in school facilities, then, have little or no effect on white students' achievement, but somewhat more effect for Negroes.[8]

In terms of the relative inequalities of the 3 component school inputs for the Negro students, the picture is different for regional inequalities than it was for inequalities within region. Whereas there was a consistency of patterns favoring student environment as the most important inequality within regions, Table 2 does not show regularities for the regional disparities. The probably reason is that schools attended by Negro students in both the North and South are largely segregated, so that exposing Southern Negro students to the fellow students of Northern Negroes does not change the student environment significantly more than other school input resources. It is in high schools where the degree of segregation for Negro students shows most difference between regions,[9] and Table 2 does reveal that student environment is the most important regional inequality of school inputs for the twelfth grade Negro students.

Table 3 is presented to show in dramatic terms the degree of inequalities of school inputs due to both the regional and racial disparities which have been separately considered in Tables 1 and 2. Table 3 presents the expected achievement level of Northern Negro students when they are supplied with the school resources of Northern whites and the expected achievement of Southern whites given the school resources of Southern Negroes. At their present level of resources these two groups are very different in achievement with the Southern whites higher than the Northern

Negroes. Exposing Southern whites to Southern Negro resources reduces their achievement, while expected achievement of Northern Negroes improves when their resources are raised to the level of Northern whites.

In the twelfth grade, the initial disparity of 13 points between Northern Negroes and Southern whites is eliminated when each is given the school and family resources of racial opposites within their region. However, the convergence of expected achievement scores for these two groups is more dramatic in the sixth and ninth grades. Again there is a large difference in the average scores of Northern Negroes and Southern whites with their present resources: 11 points in the ninth grade and 9 points in the sixth grade. But in both cases the gap is closed when the average score of Northern Negroes with their <u>present resources</u> is compared to the expected achievement of Southern whites with their own family resources and the school resources of Negroes of the same region. That is, Southern whites are expected to achieve no better than Northern Negroes when the Southerners are given the school inputs for Negroes in their area while retaining their own family resources. If Southern whites are supplied with <u>both</u> the family and school resources of Southern Negroes, their expected achievement falls below that of Northern Negroes at present (5 points in grade 9; 3 points in grade 6). Finally, if the Northern Negroes are given the family and school resources of the whites in their region, and compared in terms of expected achievement with Southern whites having family and school resources of Negroes in their region, the initial disparity not only disappears but is reversed. With

initial resources, Northern Negroes were 11 points below Southern whites in the ninth grade, 9 points below in the sixth grade. When each group is given the family and school resources of the other racial group in their region, the expected achievement of Northern Negroes is 11 points above that of Southern whites in grade 9, 7 points higher in grade 6. It would appear from these results that, if Southern whites were forced to conduct their education under the same conditions as Negroes in their region, their performance would fall considerably below that of Northern Negroes.

Underlying these comparisons in grades 6 and 9 is the fact that the changes in Southern white expected achievements are much larger than the changes for the Northern Negro. The reduction in expected achievement is about three times as large for Southern whites than is the gain for Northern Negroes when the groups are given school and family resources of the other race in their region. This is reflected in the fact that while Southern whites with different resources are reduced to the same level as Northern Negroes with present resources, the increase in Northern Negro achievement under different resources does not bring their expected achievement to the level of Southern whites with present resources.

Table 4 summarizes several of the points made for selected groups from previous tables. Two different values pertaining to each of the twelve race-region-grade groups are given in Table 4. The first column in the table shows the change in achievement when the group is exposed to the school resources of the other race in the region. Note that this change is a gain in achievement for Negroes and a loss in achievement for whites. The second column gives the change in achievement after each group is given the school resources which their own race holds in the other

region. Note again that this change is a gain in achievement for Southerners and a loss for Northerners.

The following results are highlighted by Table 4:

1. The changes in expected achievement due to racial disparities of school inputs are greater than the changes due to regional disparities when race is held constant. The change values in the first column are significantly larger than the change values in the second column in all but two cases.[10] In terms of a definition of inequality of opportunity which compares school inputs weighted according to their effectiveness for achievement, the inequalities between races within regions are greater than the inequalities between regions for a given race. Moreover, recalling the results from Table 1, an ordering was established among racial inequalities in component school resources for Negro students, with differences in student environment being largest and differences in school facilities the smallest.

2. The groups in the South experience greater achievement changes due to modifications in school resources, under the hypothetical experiment conditions, than do their counterparts in the North. Making comparisons within successive pairs of values down each of the columns of Table IV (7.75 vs. 5.48, 3.74 vs. 2.46, etc.), it is clear that for each racial group the reduction of school input disparities in the South has a greater impact than the reduction of disparities in the North. This is true as regards resource disparities between races as well as between regions. In terms of the definition of inequalities of inputs assessed according to their effect on achievement, there is an interaction between region and inequalities.

The inequalities due to race or the inequalities due to region have a greater impact for each race in the South than in the North (11 of the 12 comparisons).

By way of summary, it may be noted that the original Office of Education report utilized a definition of inequality of inputs which did not link the inputs to their effectiveness for achievement. And the report did not uncover important and consistent differences between most school inputs to Negro and white students when using such a definition. The present paper has arrived at somewhat different conclusions by virtue of considering input inequalities weighted by their contribution to achievement. Under this definition, the inequalities which show up most strongly are the disparities within regions, especially the differences in student environment resources. These resources alone contribute as much to expected changes in Negro achievement as do differences in school facilities and teachers together.

Institutional Conversion Processes

The hypothetical experiments presented here point up both difficulties and advantages in the attempt to specify institutional conversion processes. On the one hand, they give promise of gaining new purchase on the enterprise of developing social accounts. With models of institutional conversion processes such as those found in the educational system, some knowledge about the probable impact of alternative public policies can be gained. In the materials presented here, for example, programs to reduce the inequalities across regions in public school resources were seen to make for a larger expected difference in student achievement than would programs to reduce differences available to racial groups within regions.

In addition, changes in the composition of the student body (which might be accomplished through policies fostering school desegregation) were shown to have a larger expected mean influence for Negro students than changes in facilities or teaching staffs.

On the other hand, models which provide information on the conversion processes of a single institution offer little opportunity for deriving estimates of the comparative impact of public programs directed at intervention in a variety of institutional settings. For example, given only the model presented here, no judgments could be made concerning the importance of programs for social change with a view to expanding job opportunities or assisting in family planning, or creating community action groups. A model which focuses on only a single institution seems largely limited to comparing alternative policies within the institution. Perhaps a more serious limitation is that such single-institution models do not permit consideration of the ways in which different sectors of the social system interact. It may frequently be the case that the effectiveness of a policy directed at one institutional sector depends on concomitant changes in other institutions. Supplements to the income of currently disadvantaged families may have a significant impact on life chances only if these families have first attained new consumer skills in budget management so that they will make those purchases which best meet their family needs. Or, improvements in educational programs to increase student motivation may be limited in their impact if job opportunities for minorities do not change so that increased education is more clearly relevant for a student seeking a better job.

Besides this kind of interaction between institutional changes, some social institutions can facilitate or impede the adoption of changes in another institution. An example here would be school desegregation programs which are severely limited in some cities due to existing political boundaries and deficiencies in the housing market.

What is needed for the development of a system of social accounts in both a specification of conversion processes in many institutions and the creation of techniques for linking these institutions to one another in a more complete model. Since no single national study is likely to be able to examine all institutions, this means that strategies for integrating results from many studies must be evolved. In this paper, suggestions for some such strategies have been presented. In the Office of Education study, measures of family and school characteristics were obtained, so that changes in these institutional sectors could be viewed as competing. Because there existed a variable common to both the O.E. study and that conducted by the military services--percentile achievement scores--it was possible to combine results from the two. Had information been available concerning the relationship between achievement test scores and entrance into various occupational levels, a connection with the job market could have been established. An important strategy for social accounting, then, would be to use together separate institutional studies which have one or more variables in common.

But to meet this need for synthesizing results from various studies, considerable work is necessary in identifying and developing general

statistical models intended to link together results from many studies. Coleman[10] has discussed some of the ways in which economists' input-output analysis might provide such a general basis. The regression analyses reported here, with some small extension, might provide another example. One model of a fully developed system of social accounts would provide regression equations in standardized form for specifying the conversion processes within separate institutions, and other regression equations for representing the relationships between components of different institutions.

One difficulty usually encountered in using reported multiple regression equations for synthesizing activities is that ordinarily several indicators of an input variable are related to a selected output variable. Unless the studies which are to be combined have exactly the same multiple indicators of some component, difficulties arise. For example, in the hypothetical experiments reported here, the multiple regression equations included six measures of family background, and thus six--rather than one--regression coefficients for the transformation process. Unless another study has the same six measures, it could not be linked with this one through the family background variable.

However, it is relatively easy to combine these six measures into a single coefficient and to estimate the overall family impact on achievement in an equation which includes school components. Instead of a single regression analysis, two would be performed. The first regression would include only family background measures. Values of the unstandardized regression coefficients (b_i) would be obtained for the effect of each of the six background measures on achievement. Next,

a new family background variable is defined for each individual in the sample by solving an equation such as (1) above, with these b_i values and the values of each of the six family background variables (X_i) for the individual.[12] A second regression on achievement is now performed using this summary measure for family background and the other measures for school components.

Such an additional analysis was in fact performed and the results are shown in Table V. The table shows the regression coefficients in standardized form for summary measures of family background and the three school components. Each value represents the expected amount by which a unit change in family or school components (measured in standard deviation units) becomes converted in student academic achievement.

TABLE 1

EXPECTED LEVELS OF ACHIEVEMENT OF NORTHERN AND SOUTHERN NEGROES WHEN SPECIFIC RESOURCES ARE RAISED TO THE LEVEL OF WHITES IN THE SAME REGION

	North Negroes			South Negroes		
	Average Achievement	Percent Fail AFQT Test	Percent Not Entering College	Average Achievement	Percent Fail AFQT Test	Percent Not Entering College
Grade 12*						
1. Present Resources	52.4	20	72	46.2	33	78
2. Change School Facilities	52.4	20	72	46.5	32	78
3. Change Teacher Resources	53.9	17	70	48.4	27	77
4. Change Student Environment Resources	54.8	16	69	49.8	24	76
5. Change Teachers and School Facilities	54.0	17	70	48.7	26	76
6. Change all three School Resources	56.4	13	68	52.1	19	74
7. Change all School and Family Resources	58.5	10	66	55.4	13	71
Grade 9*						
1. Present Resources	40.8	16	76	35.5	27	84
2. Change School Facilities	41.7	14	76	35.0	28	84
3. Change Teacher Resources	41.1	15	76	37.7	21	82
4. Change Student Environment Resources	42.5	13	75	38.2	20	82
5. Change Teachers and School Facilities	42.0	14	75	37.2	23	83
6. Change all three School Resources	43.6	11	74	39.9	16	80
7. Change all School and Family Resources	46.0	8	70	42.4	12	75
Grade 6*						
1. Present Resources	24.2	11	77	20.8	18	85
2. Change School Facilities	24.4	10	77	20.6	18	86
3. Change Teacher Resources	24.7	10	77	23.2	12	83
4. Change Student Environment Resources	25.9	8	75	22.0	15	84
5. Change Teachers and School Facilities	24.9	9	76	22.9	12	83
6. Change all three School Resources	26.6	7	74	24.0	10	82
7. Change all School and Family Resources	28.6	5	71	25.9	7	79

*The national averages and standard deviations on the achievement tests are as follows:

	National Mean	Standard Deviation
Grade 12	63.5	16.0
Grade 9	50.6	15.3
Grade 6	31.4	12.7

TABLE 2

EXPECTED LEVELS OF ACHIEVEMENT OF NEGRO AND WHITE SOUTHERNERS WHEN SPECIFIC RESOURCES ARE RAISED TO THE LEVEL OF NORTHERNERS OF THE SAME RACE

	Negro South			White South		
	Average Achievement	Percent Fail AFQT Test	Percent Not Entering College	Average Achievement	Percent Fail AFQT Test	Percent Not Entering College
Grade 12*						
1. Present Resources	46.2	33	78	65.0	5	64
2. Change School Facilities	46.7	31	78	66.2	4	63
3. Change Teacher Resources	47.5	30	77	65.3	4	64
4. Change Student Environment Resources	48.4	27	77	65.8	4	64
5. Change Teachers and School Facilities	47.9	28	77	66.5	4	63
6. Change all three School Resources	50.1	23	75	67.2	3	63
7. Change all School and Family Resources	51.0	22	75	68.5	3	62
Grade 9*						
1. Present Resources	35.5	27	84	52.1	5	70
2. Change School Facilities	38.6	19	82	53.9	4	68
3. Change Teacher Resources	36.6	24	83	51.9	5	70
4. Change Student Environment Resources	36.8	24	83	52.4	5	69
5. Change Teachers and School Facilities	39.8	17	80	53.7	4	68
6. Change all three School Resources	41.2	14	78	54.0	4	68
7. Change all School and Family Resources	42.1	12	78	55.5	3	66
Grade 6*						
1. Present Resources	20.8	18	85	33.3	4	73
2. Change School Facilities	23.3	12	83	34.0	4	71
3. Change Teacher Resources	22.0	14	84	33.2	4	73
4. Change Student Environment Resources	21.2	17	85	33.2	4	73
5. Change Teachers and School Facilities	24.5	9	81	33.9	4	71
6. Change all three School Resources	24.8	8	80	33.8	4	71
7. Change all School and Family Resources	25.8	7	79	35.5	3	69

*The national averages and standard deviations on the achievement tests are as follows:

	National Mean	Standard Deviation
Grade 12	63.5	16.0
Grade 9	50.6	15.3
Grade 6	31.4	12.7

TABLE 3

EXPECTED LEVELS OF ACHIEVEMENT OF NORTHERN NEGROES AND SOUTHERN WHITES WHEN SPECIFIC RESOURCES ARE CHANGED TO THE LEVEL OF THE OTHER RACE IN THEIR REGION

	Negro North			White South		
	Average Achievement	Percent Fail AFQT Test	Percent Not Entering College	Average Achievement	Percent Fail AFQT Test	Percent Not Entering College
Grade 12*						
1. Present Resources	52.4	20	72	65.0	5	64
2. Change School Facilities	52.4	20	72	65.2	4	64
3. Change Teacher Resources	53.9	17	70	62.9	6	66
4. Change Student Environment Resources	54.8	16	69	63.1	6	66
5. Change Teachers and School Facilities	54.0	17	70	63.0	6	66
6. Change all three School Resources	56.4	13	68	61.1	8	68
7. Change all School and Family Resources	58.5	10	66	58.2	11	70
Grade 9*						
1. Present Resources	40.8	16	76	52.1	5	70
2. Change School Facilities	41.7	14	76	52.0	5	70
3. Change Teacher Resources	41.1	15	76	41.4	18	79
4. Change Student Environment Resources	42.5	13	75	50.8	6	70
5. Change Teachers and School Facilities	42.9	14	75	41.3	18	79
6. Change all three School Resources	43.6	11	74	40.0	20	80
7. Change all School and Family Resources	46.0	8	70	35.4	31	84
Grade 6*						
1. Present Resources	24.2	11	77	33.3	4	73
2. Change School Facilities	24.4	10	77	33.2	4	73
3. Change Teacher Resources	24.7	10	77	25.8	13	81
4. Change Student Environment Resources	25.9	8	75	33.2	4	73
5. Change Teachers and School Facilities	24.9	9	76	25.7	14	81
6. Change all three School Resources	26.6	7	74	25.6	14	82
7. Change all School and Family Resources	28.6	5	71	21.2	24	87

*The national averages and standard deviations on the achievement tests are as follows:

	National Mean	Standard Deviation
Grade 12	63.5	16.0
Grade 9	50.6	15.3
Grade 6	31.4	12.7

TABLE 4

EFFECTS ON ACHIEVEMENT DUE TO CHANGING SCHOOL RESOURCES BY RACE AND BY REGION, FOR NEGROES AND WHITES IN THREE GRADES

	Change due to Race[1]	Change due to Region[2]
Grade 6		
White South	7.8	0.5
White North	5.5	0
Negro South	3.7	4.0
Negro North	2.5	-0.7
Grade 9		
White South	3.9	2.1
White North	2.8	1.0
Negro South	5.3	3.8
Negro North	4.0	-0.8
Grade 12		
White South	12.1	1.8
White North	6.1	0.3
Negro South	3.0	5.7
Negro North	4.8	0.6

1. For white students: loss in achievement due to exposure to school resources of Negro students in the same Region.
   For Negro students: gain in achievement due to exposure to school resources of white students in the same Region.

2. For Northern students: loss in achievement due to exposure to school resources of Southern students of the same race.
   For Southern students: gain in achievement due to exposure to school resources of Northern students of the same race.

TABLE 5

STANDARDIZED REGRESSION COEFFICIENTS MEASURING TRANSFORMATION PROCESSES OF SCHOOL OR FAMILY RESOURCES ON STUDENT ACADEMIC ACHIEVEMENT

	Family Resources	School Facility Resources	Teacher Resources	Student Environment Resources
Grade 12				
Negro North	.23	.13	.13	.21
Negro South	.22	.07	.12	.23
White North	.34	.10	.09	.09
White South	.34	.07	.04	.11
Grade 9				
Negro North	.26	.14	.12	.16
Negro South	.22	.16	.09	.19
White North	.40	.10	.11	.08
White South	.38	.05	.09	.07
Grade 6				
Negro North	.27	.04	.14	.14
Negro South	.29	.14	.12	.12
White North	.34	.05	.07	.12
White South	.40	.06	.10	.07

Footnotes

[1]The authors bear equal responsibility for this paper. Valuable comments on an earlier draft were received from a seminar involving the members of the Johns Hopkins Center for the Study of Social Organization of Schools. Mrs. Nancy Karweit supervised the data analyses involved for this paper and her assistance is gratefully acknowledged.

[2]R. Bauer (ed.), Social Indicators, Cambridge, Massachusetts: M.I.T. Press, 1966; Otis Dudley Duncan, "Discrimination Against Negroes," The Annals, Vol. 371, 1967, pp. 85-103; Philip M. Hauser, "Social Accounting," in P.F. Lazarsfeld, W.H. Sewell and H.L. Wilensky (eds.), The Uses of Sociology, New York: Basic Books, Inc., 1967, pp. 839-875; Wilbert E. Moore and Elinor B. Sheldon, "Monitoring Social Change: A Conceptual and Programmatic Statement," Proceedings of the Social Statistics Section, 1965, Washington, D.C.: American Statistical Association, 1966, pp. 144-149.

[3]James S. Coleman, Race Relations and Social Change, Report No. 1, Johns Hopkins Center for the Study of Social Organization of Schools (mimeo).

[4]James S. Coleman, Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederick D. Weinfeld, Robert L. York, Equality of Educational Opportunity, Washington: Government Printing Office, 1966.

[5]In the ninth and twelfth grade samples, there were six family background measures, 11 school facility measures, 7 teacher attributes and 5 student body variables. In the sixth grade, the number of variables in each group was 6, 4, 7 and 4, respectively. The names of the variables in each group are the same as those used in the regression of the original Report,

School characteristics are:

- Per pupil expenditure on staff
- Volumes per student in library
- Science lab facilities (9 and 12 only)
- Extracurricular activities (9 and 12 only)
- Presence of accelerated curriculum (9 and 12 only)
- Comprehensiveness of curriculum (9 and 12 only)
- Use of tracking (9 and 12 only)
- Movement between tracks (9 and 12 only)
- Size
- Guidance counselors (9 and 12 only)
- School location (city, suburb, town, country)

Student body characteristics are:

- Proportion whose families own encylopedias
- Number of student transfers
- Attendance
- Proportion planning to attend college (9 and 12 only)
- Teachers' perception of student body quality (1, 3, 6 only)
- Average hours of homework (9 and 12 only)

Teacher variables are:
- Average mother's education
- Average years experience in teaching
- Localism
- Average level of education of teachers
- Average score on vocabulary test
- Preference for teaching middle-class, white-collar students
- Proportion white teachers

Family background variables are:
- Parents' education
- Structural integrity of the home
- Smallness of family
- Items in home
- Reading material in home
- Urbanism of background

[5a]Bernard D. Karpinos, "The Mental Qualification of American Youths for Military Service and Its Relationship to Education Attainment," Proceedings of the Social Statistics Section, 1966, Washington, D.C.: American Statistical Association, pp. 92-111. This data certainly has problems for estimating the level of educational attainment from AFQT percentile scores which derive from the fact that only a portion of American youth ever actually are required to take the AFQT. Consequently, it is the differences in the estimated probabilities of continuing college under changed school resources which is to be noticed, rather than the specific individual values.

[6]Coleman, et.al., Op. Cit., pp. 205, 208, 211-212.

[7]Ibid, pp. 302-304.

[8]Table 4 presents further values for a general assessment of the regional input inequalities weighted by effectiveness on achievement.

[9]Coleman, et.al., Op. Cit., p. 40.

[10]The probability of only 2 out of 12 occurring by chance is .05.

[11]Coleman, Op. Cit., pp. A·1 - A·7.

[12]In practice, this can be accomplished by working with the original cross product matrices rather than by returning to individual observations.